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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/827,079	04/19/2004	Wen Chin Lin	24061.90 (TSMC2003-0542)	1883
42717	7590	10/31/2005	EXAMINER	
HAYNES AND BOONE, LLP 901 MAIN STREET, SUITE 3100 DALLAS, TX 75202			NGUYEN, VAN THU T	
			ART UNIT	PAPER NUMBER
			2824	

DATE MAILED: 10/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/827,079

Applicant(s)

LIN ET AL.

Examiner

VanThu Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 10-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-9,14 and 17-20 is/are rejected.
- 7) ☒ Claim(s) 2,3,15 and 16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____.  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>04/19/2004</u> .  | 6) <input type="checkbox"/> Other: ____.                                    |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-9 and 14-20, drawn to structure of MRAM, classified in class 365, subclass 67.
  - II. Claims 10-13, drawn to manufacturing of MRAM, classified in class 438, subclass 1+.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention I has separate utility such as it does not require the manufacturing method of invention II. See MPEP § 806.05(d).
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and fields of search, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with David M. O'Dell on October 24, 2005 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-9 and 14-20. Affirmation of this election must be made by applicant in replying to this Office action. Claims 10-13 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.
5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the

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currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 4-7, 9, 14, 17-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Hoenigschmid (U.S. Patent No. 6,522,579).

**Regarding claim 1**, Hoenigschmid discloses, see entire specification, a magnetic random access memory (MRAM) cell, comprising: an MRAM cell stack (magnetic stack 14, see FIG. 1) located over an inherent substrate and including a pinned layer (hard layer 20, see FIG. 1), a tunneling barrier layer (tunnel layer 18, see FIG. 1), and a free layer (soft layer 16, see FIG. 1), the tunneling barrier layer interposing the pinned layer and the free layer (tunnel layer 18 is between soft layer 16 and hard layer 20, see FIG. 1); and

first and second write lines (word lines 212 and bit lines 222, see FIG. 5b) spanning at least one side of the MRAM cell stack (word lines 212 and bit line 222 spanning both sides of MRAM cell stack) and defining a projected region of intersection of the MRAM cell stack and the first and second write lines (see the non-rectangular parallelogram shapes, intersections between word lines 212 and bit lines 222);

wherein the first write line (word lines 212, see FIG. 5b) extends in a first direction (vertical direction) within the projected region of intersection; and wherein the second write line (bit lines 222, see FIG. 5b) extends in a second direction (horizontally downward from left to right) within the projected region of intersection, wherein the first and second directions are angularly offset by an offset angle ranging between 45 and 90 degrees, exclusively (e.g. 60 degrees, see column 4, lines 26-55).

Hoenigschmid mentions that the angle 124/224 may range from 10 to 80 degrees, depends on size and aspect ratio of the tunnel junction. It would have been obvious for one with ordinary skill in the art to break the range into first subset of 10°-45° and second subset of 46°-80°, which obvious is between 45° and 90°, exclusively.

**Regarding claim 4**, Hoenigschmid discloses wherein one of the first and second write lines (e.g. bit lines 222 in FIG. 5b) is substantially perpendicular (e.g. 80°) to an easy axis of the MRAM cell stack within the projected region of intersection (as shown in FIG. 7, the easy axis of MRAM cell stack is along word lines 212).

**Regarding claim 5**, Hoenigschmid further discloses the offset angle is greater than about 75 degrees (e.g. 76°-80°, which is within the second subset).

**Regarding claim 6**, Hoenigschmid also discloses wherein one of the first and second directions (e.g. direction of bit lines 222) is angularly offset from a substantially parallel orientation relative to an easy axis of the MRAM cell stack (e.g. direction of word lines 212).

**Regarding claim 7**, Hoenigschmid inherently discloses the direction of the angular offset relative to the substantially parallel orientation corresponds to a switching threshold shift because

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non-perpendicular first and second magnetic fields, which produce by non-perpendicular word lines and bit lines, cause the switching threshold shifts along the easy axis inherently.

**Regarding claim 9**, Hoenigschmid discloses both word lines 212 and bit lines 222 span opposing sides of the MRAM cell stacks (as mentioned above in rejection of claim 1)

**Regarding claims 14, 17-20** are rejected under U.S.C. 102(b) since they recite similar limitations as in claims 1, 4-7, 9.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hoenigschmid in view of Parkin (U.S. Patent No. 5,936,293).

Hoenigschmid discloses, as applied in prior rejection of claim 1, all claimed subject matter except further limitations as in claim 8.

**Regarding claim 8**, Parkin discloses, in FIG. 6C, an MRAM cell stack comprising a bottom wiring layer 11, hard layer 18 (formed as bi-layer of layers 14 and 17), insulting layer 20, soft layer 32.

Since Hoenigschmid and Parkin are both from the same field of endeavor, the purpose disclosed by Parkin would have been recognized in the pertinent art of Hoenigschmid.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to replace MRAM stack cell disclosed Hoenigschmid with MRAM stack cell disclosed Parkin because it is one of the known structures for MRAM stack cell.

***Allowable Subject Matter***

10. Claims 2-3, 15-16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

The prior art made of record and considered pertinent to the applicant's disclosure does not teach or suggest the claimed limitations. Hoenigschmid, Farrar, Ishikawa et al., taken individually or in combination, do not teach the claimed invention having the following limitations, in combination with the remaining claimed limitations:

- (i) wherein at least one of the first and second write lines includes a plurality of sections, each of the plurality of sections angularly offset from a neighboring one of the plurality of sections (as in claim 2); or
- (i) wherein neither of the first and second write lines is parallel to an easy axis of the MRAM cell stack within the projected region of intersection (as in claim 3); or
- (iii) wherein at least one of the plurality of first and second write lines interconnects ones of the plurality of MRAM cells and has a zigzag-shaped profile (as in claim 15).

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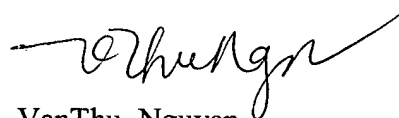
***Conclusion***

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to VanThu Nguyen whose telephone number is (571) 272-1881. The examiner can normally be reached on Monday-Friday, 9:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

October 24, 2005



VanThu Nguyen  
Primary Examiner  
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